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10/614,855

07/07/2003

Xiao-An Zhang

200300074

9152

22879

7590

11/27/2007

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FORT COLLINS, CO 80527-2400

EXAMINER

RUDE, TIMOTHY L

ART UNIT

PAPER NUMBER

2871

MAIL DATE

DELIVERY MODE

11/27/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/614,855

Applicant(s)

ZHANG ET AL.

Examiner

Timothy L. Rude

Art Unit

2871

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) 2-12, 14-16, 18-28 and 30-32 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 13, 17, 29 and 33-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claims***

Claims remain unchanged since the Non-final Rejection mailed 12 June 2007.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 13, 17, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devonald et al (Devonald) USPAT 5,275,924 in view of Zhang et al (Zhang) US PG PUB 2002/0075557 A1.

As to claims 1 and 17, Devonald discloses a method of making a non-centrosymmetric bistable switchable film [(electro-optic memory) col. 9, lines 52-68 and col. 32, line 40 through col. 34, line 17] that is a three-dimensional [col. 10, lines 15-25 and 50-65] molecular switch assembly, formed on a substrate, said molecular assembly comprising:

a first monolayer of seed molecules for initiating self-assembled molecular growth, said first monolayer formed on said substrate [end of molecule, col. 1, line 54];

a second monolayer of active molecules comprising a plurality of rotor moieties and stator moieties, said second monolayer of active molecules formed on said first monolayer of seed molecules, with a one-to-one correspondence between molecules in said first monolayer and said second monolayer [X as selected from molecules at col. 1, line 60 through col. 2, line 9];

a third monolayer of spacer molecules, formed on said second monolayer of active molecules, with a one-to-one correspondence between molecules in said second monolayer and said third monolayer [other end of molecule, col. 1, line 54]; and

a plurality of alternating second monolayers and third monolayers having said one-to-one correspondence [stacking, col. 10, lines 15-25 and 50-65], wherein said

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active molecules are switchable between two different states by an applied external electric field [electro-optic memory].

Devonald does not explicitly claim 1) his first stator molecule [connected to substrate] is a "seed" molecule or 2) one rotor moiety supported between two stator moieties.

Devonald teaches 1) that use of the Langmuir-Blodgett technique is superior to electric field pointing in that it produces NLO active species that are aligned in parallel. Examiner considers such a technique to read on Applicant's "seed" molecule method and Applicant's forming "vial molecular self-assembly", especially in view of Devonald's teaching of stacking layers of like or alternate nature [stacking, col. 10, lines 15-25 and 50-65].

Devonald is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to use seed molecules to form ordered layers by the preferred Langmuir-Blodgett technique to produces NLO active species that are aligned in parallel.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald with the seed molecule technique to produces NLO active species that are aligned in parallel.

Zhang teaches 2) the use of one rotor moiety supported between two stator moieties [634, both ends, Figure 6], wherein color change occurs through a molecular conformation change that alters the degree of electron conjugation across a said active molecule and, thereby, the highest occupied molecular orbital - lowest unoccupied

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molecular orbital states of said active molecule [0074], as a preferred structure to be produced by the well known Langmuir-Blodgett technique [0106] to comprise an improved bi-stable switchable film with improved contrast [Abstract].

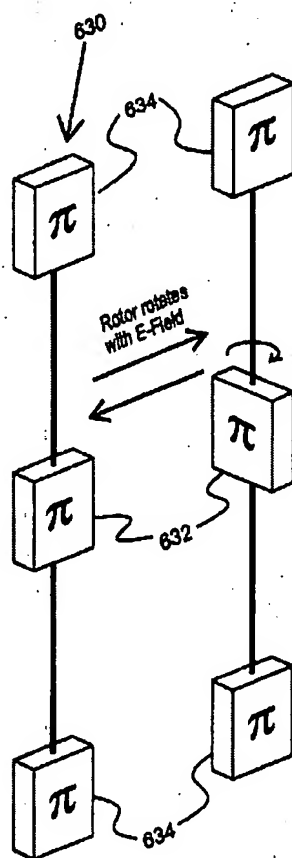


FIG. 6

Zhang is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to add the use of one rotor moiety supported between two stator moieties [634, both ends, Figure 6] as a preferred structure to be produced by the

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well known Langmuir-Blodgett technique [0106] to comprise an improved bi-stable switchable film with improved contrast [Abstract].

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald with the use of one rotor moiety supported between two stator moieties [634, both ends, Figure 6] of Zhang as a preferred structure to be produced by the well known Langmuir-Blodgett technique [0106] to comprise an improved bi-stable switchable film with improved contrast [Abstract].

As to claims 13 and 29, Devonald in view of Zhang teach, as combined above, the three-dimensional molecular assembly of Claim 1.

Devonald does not explicitly teach an assembly wherein said substrate comprises a first electrode and wherein said molecular assembly further comprises a second electrode formed on an uppermost monolayer.

Devonald teaches that his films are applicable to electro-optic optical switching devices [col. 9, lines 52-57] with improved optical properties.

Devonald is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to add electrodes across the assembly of layers [Applicant's substrate comprises a first electrode and wherein said molecular assembly further comprises a second electrode formed on an uppermost monolayer] to comprise an electro-optic optical switching device with improved optical properties.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald with a substrate comprising a first electrode and wherein said molecular assembly further comprises a second electrode formed on an uppermost monolayer to comprise an electro-optic optical switching device with improved optical properties.

Claims 33-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devonald in view of Zhang, and further in view of Vincent et al (Vincent) USPAT 6,556,470 B1.

As to claims 33-40, Devonald in view of Zhang teach the device above.

Devonald does not explicitly disclose switching between a transparent state and a colored state.

Vincent teaches an electrically rotated molecular bistable switch [Abstract, col. 8, lines 21-44, and col. 12, lines 1-11] that switches between a colored state and a transparent state [Abstract] to comprise a satisfactory field addressable rewriteable media for a plurality of uses [Title and Abstract].

Vincent is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to add switching between a colored state and a transparent state as a desirable implementation of a field addressable rewriteable memory for a plurality of uses.



Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald in view of Zhang with the switching between a colored state and a transparent state of Vincent as a desirable implementation of a field addressable rewriteable memory for a plurality of uses.

As to claims 33-40, Devonald in view of Zhang teach the device above.

Devonald does not explicitly disclose switching between a transparent state and a colored state.

Zhang, as combined above, teaches an electrically rotated molecular bistable switch [Figure 2a] that switches between a colored [black] state and a transparent state to comprise a satisfactory molecular switch with improved contrast [Abstract].

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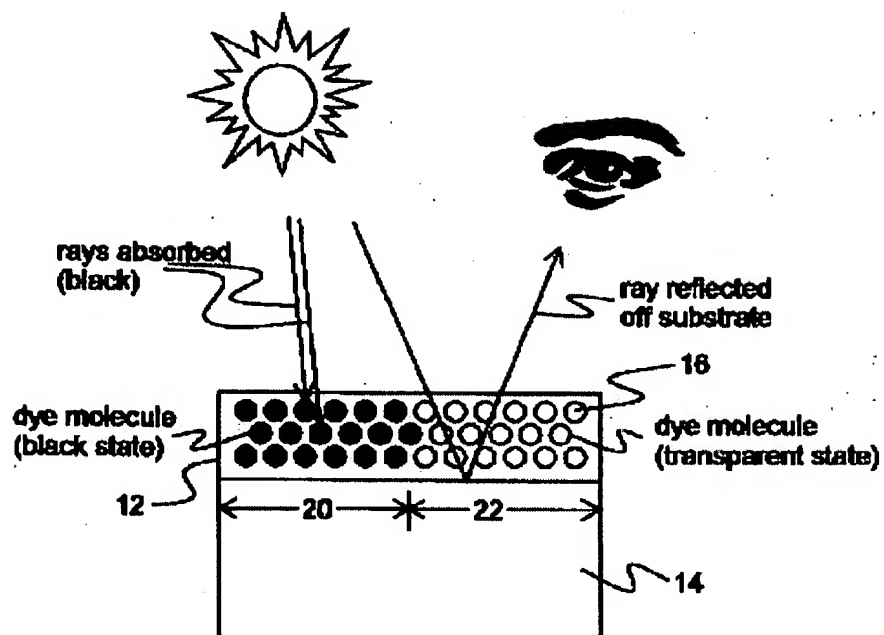


FIG. 2a

Claims 1, 13, 17, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devonald et al (Devonald) USPAT 5,275,924 in view of Zhang et al (Zhang2) US PG PUB 2002/0075420 A1.

As to claims 1 and 17, Devonald discloses a method of making a non-centrosymmetric bistable switchable film [(electro-optic memory) col. 9, lines 52-68 and col. 32, line 40 through col. 34, line 17] that is a three-dimensional [col. 10, lines 15-25 and 50-65] molecular switch assembly, formed on a substrate, said molecular assembly comprising:

a first monolayer of seed molecules for initiating self-assembled molecular growth, said first monolayer formed on said substrate [end of molecule, col. 1, line 54];

a second monolayer of active molecules comprising a plurality of rotor moieties and stator moieties, said second monolayer of active molecules formed on said first monolayer of seed molecules, with a one-to-one correspondence between molecules in said first monolayer and said second monolayer [X as selected from molecules at col. 1, line 60 through col. 2, line 9];

a third monolayer of spacer molecules, formed on said second monolayer of active molecules, with a one-to-one correspondence between molecules in said second monolayer and said third monolayer [other end of molecule, col. 1, line 54]; and

a plurality of alternating second monolayers and third monolayers having said one-to-one correspondence [stacking, col. 10, lines 15-25 and 50-65], wherein said

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active molecules are switchable between two different states by an applied external electric field [electro-optic memory]:

Devonald does not explicitly claim 1) his first stator molecule [connected to substrate] is a "seed" molecule or 2) one rotor moiety supported between two stator moieties.

Devonald teaches 1) that use of the Langmuir-Blodgett technique is superior to electric field pointing in that it produces NLO active species that are aligned in parallel. Examiner considers such a technique to read on Applicant's "seed" molecule method and Applicant's forming "vial molecular self-assembly", especially in view of Devonald's teaching of stacking layers of like or alternate nature [stacking, col. 10, lines 15-25 and 50-65].

Devonald is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to use seed molecules to form ordered layers by the preferred Langmuir-Blodgett technique to produces NLO active species that are aligned in parallel.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald with the seed molecule technique to produces NLO active species that are aligned in parallel.

Zhang2 teaches 2) the use of one rotor moiety supported between two stator moieties [0002] as a related structure, wherein color change occurs through a molecular conformation change that alters the degree of electron conjugation across a said active molecule and, thereby, the highest occupied molecular orbital - lowest unoccupied

molecular orbital states of said active molecule [0085], to comprise an improved bi-stable switchable film with improved contrast [Abstract].

Zhang2 is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to add the use of one rotor moiety supported between two stator moieties [0002] as a related structure to comprise an improved bi-stable switchable film with improved contrast [Abstract].

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald with the use of one rotor moiety supported between two stator moieties [0002] as a related structure to comprise an improved bi-stable switchable film with improved contrast [Abstract].

As to claims 13 and 29, Devonald in view of Zhang2 teach, as combined above, the three-dimensional molecular assembly of Claim 1.

Devonald does not explicitly teach an assembly wherein said substrate comprises a first electrode and wherein said molecular assembly further comprises a second electrode formed on an uppermost monolayer.

Devonald teaches that his films are applicable to electro-optic optical switching devices [col. 9, lines 52-57] with improved optical properties.

Devonald is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to add electrodes across the assembly of layers [Applicant's substrate comprises a first electrode and wherein said molecular assembly

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further comprises a second electrode formed on an uppermost monolayer] to comprise an electro-optic optical switching device with improved optical properties.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald with a substrate comprising a first electrode and wherein said molecular assembly further comprises a second electrode formed on an uppermost monolayer to comprise an electro-optic optical switching device with improved optical properties.

Claims 33-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Devonald in view of Zhang2, and further in view of Vincent et al (Vincent) USPAT 6,556,470 B1.

As to claims 33-40, Devonald in view of Zhang2 teach the device above.

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Vincent teaches an electrically rotated molecular bistable switch [Abstract, col. 8, lines 21-44, and col. 12, lines 1-11] that switches between a colored state and a transparent state [Abstract] to comprise a satisfactory field addressable rewriteable media for a plurality of uses [Title and Abstract].

Vincent is evidence that workers of ordinary skill in the art would find the reason, suggestion, or motivation to add switching between a colored state and a transparent

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state as a desirable implementation of a field addressable rewriteable memory for a plurality of uses.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Devonald in view of Zhang2 with the switching between a colored state and a transparent state of Vincent as a desirable implementation of a field addressable rewriteable memory for a plurality of uses.

As to claims 33-40, Devonald in view of Zhang2 teach the device above.

Devonald does not explicitly disclose switching between a transparent state and a colored state.

Zhang2, as combined above, teaches an electrically rotated molecular bistable switch [Figure 2a] that switches between a colored [black] state and a transparent state to comprise a satisfactory molecular switch with improved contrast [Abstract].

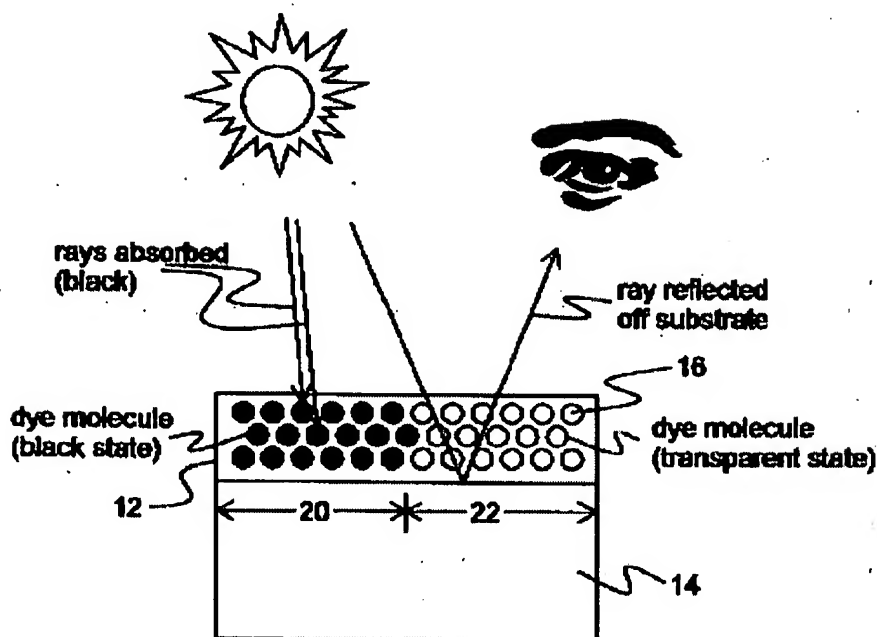


FIG. 2a

### ***Response to Arguments***

Applicant's arguments filed on 13 September 2007 have been fully considered but they are not persuasive.

#### **Applicant's ONLY substantive arguments are as follows:**

(1) Regarding base claims, Zhang cannot be used to modify Devonald because it would change the principle of operation and render the reference inoperable for its intended purpose.

(2) Regarding base claims, Zhang2 cannot be used to modify Devonald because it would change the principle of operation and render the reference inoperable for its intended purpose.



(3) Dependent claims are allowable because they directly or indirectly depend from an allowable base claim.

Examiner's responses to Applicant's ONLY arguments are as follows:

(1) It is respectfully pointed out that Devonald teaches fabrication of a three-dimensional, layered, molecular bistable switchable film for electro-optic memory by the Langmuir-Blodgett technique. Zhang teaches the use of one rotor moiety supported between two stator moieties in order to obtain a bistable switchable film for electro-optic memory with improved switching contrast. Examiner cannot find any reason why one of ordinary skill in the art would not be motivated to modify the three-dimensional, layered, molecular bistable switchable film for electro-optic memory made by the Langmuir-Blodgett technique of Devonald with the use of one rotor moiety supported between two stator moieties of Zhang in order to obtain a bistable switchable film for electro-optic memory with improved switching contrast. The principle of operation of Devonald is considered to be a three-dimensional, layered, molecular bistable switchable film for electro-optic memory that would not be rendered inoperative by the use of one rotor moiety supported between two stator moieties of the bistable switchable film for electro-optic memory of Zhang in order to obtain improved switching contrast.

(2) It is respectfully pointed out that Devonald teaches fabrication of a three-dimensional, layered, molecular bistable switchable film for electro-optic memory by the Langmuir-Blodgett technique. Zhang<sup>2</sup> teaches the use of one rotor moiety supported between two stator moieties in order to obtain a bistable switchable film for electro-optic

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memory with improved switching contrast. Examiner cannot find any reason why one of ordinary skill in the art would not be motivated to modify the three-dimensional, layered, molecular bistable switchable film for electro-optic memory made by the Langmuir-Blodgett technique of Devonald with the use of one rotor moiety supported between two stator moieties of Zhang2 in order to obtain a bistable switchable film for electro-optic memory with improved switching contrast. The principle of operation of Devonald is considered to be a three-dimensional, layered, molecular bistable switchable film for electro-optic memory that would not be rendered inoperative by the use of one rotor moiety supported between two stator moieties of the bistable switchable film for electro-optic memory of Zhang2 in order to obtain improved switching contrast.

(3) It is respectfully pointed out that in so far as Applicant has not argued rejection(s) of the limitations of dependent claim(s), Applicant has acquiesced said rejection(s).

Any references cited but not applied are relevant to the instant Application.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy L. Rude whose telephone number is (571) 272-2301. The examiner can normally be reached on Mon-Thurs.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Nelms can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



tlr

Timothy L Rude  
Examiner  
Art Unit 2871



David Nelms  
Supervisory Patent Examiner  
Technology Center 2800